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ABSTRACT
A summary analysis is made of problems encountered by retrieval staffs in three states during the initial year of the Pilot State Project in Information Dissemination. Problems discussed are: (1) Computer Related; (2) Furnishing the client with complete copy; (3) Record keeping and Filing; and (4) Staffing. Recommendations resulting from the experiences of the first three pilot states, and which might be useful to other states that are attempting to establish information dissemination projects, are: (1) A state should plan initially to provide its own computerized search capacity; (2) A state that decides to install QUERY might well plan to have their computer and retrieval personnel visit a similar installation that has already been through the process, so that ways of overcoming problems can be learned; (3) The Office of Education or the QUERY contractor should provide assistance to new installations until the program is operational; (4) The rationale behind packaged information should be well understood; (5) Retrieval services should adopt a means of continual reassessment of their methods; (6) Procedures for completing the process should be determined in advance; (7) Personnel of an information service would do well to visit an existing retrieval service and analyze their record-keeping and filing systems; and (8) The qualifications and capabilities of the staff should be determined in advance. (DB)

PROBLEMS IN INFORMATION RETRIEVAL --

Materials from the

USOE Pilot State Dissemination Program

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September, 1971

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CONTENTS

PROBLEMS IN INFORMATION RETRIEVAL

After the initial year of the Pilot State project in information dissemination, some summary analysis of the problems encountered by the retrieval staffs in the three States might usefully be attempted. The energy, ingenuity and unflagging effort with which retrieval personnel have met these problems and attempted to work out solutions have been commendable; but, in general, these issues have been encountered and dealt with on an ad hoc basis. Understandably enough, what would be the basic and most problematic issues to be confronted in setting up a central State educational information service could only be partially foreseen a year ago by any State, and not very clearly outlined. This, of course, is the purpose of pilot projects--so that such issues can be more carefully delineated in advance, and problems can be anticipated and perhaps avoided or alleviated for similar undertakings later on.

I. Computer Related Problems

The first group of problems relates to the objective of establishing a computerized information retrieval capability for the information service in each State, the area which has presenced the most time-consuming and expensive difficulties.

A. Turnaround time

The two western States in the project depended on a large regional computerized information retrieval center during their initial year of operation. Both States have expressed satisfaction with their

relationship with the Regional Center and have commented favorably on its various services. State A, in particular, has emphasized that they have been relatively pleased with the Regional Center, but observation of this arrangement has led the evaluation team to the judgment that not having control over all the steps involved in the computerized retrieval process created some special problems for these two States.

One of the problems evident in the Regional Center service has been excessive turn-around time. The project director of State A anticipated this difficulty very early. He sent two test requests for information to the Regional Center before his State's project was officially underway and did not get a return for three weeks. This led State A in the earliest phases of its project to provide computerized searches within their own State (although they are still not operational in terms of economic feasibility-- as of September, 1971). That State's later experiences with the Regional Center supplied continuing justification for this decision. In the early weeks of the project, their average turn-around time on requests for information referred to the Regional Center for a search of ERIC was 4.7 weeks. This was figured on the basis of dates on the office log kept in State A for requests received in October and the first two weeks in November. There was some improvement in early December--turn-around time for one request was two weeks, and for another under three weeks--but it was not consistent. No request sent to the Regional Center on or after Friday, December 11, 1970, had been returned by the end of the year. In mid-January, the Center closed down altogether.

The lengthy turn-around was true only for requests referred to the Regional Center.. Requests not sent there but handled in the State A Retrieval-Dissemination Center during those particular weeks, when the volume of requests was still relatively low, received literally same-day service--or, for a request received on Friday, information would be returned on Monday.

The same story held true in State B. Average turn-around time for requests referred to the Regional Center (figured on the basis of dates on the office log sheet for requests received in October) was almost four and a half weeks. Again, requests handled in the State Information Center, and not sent to the Regional Center, were answered quickly. Also, the State Information Center occasionally would send information which it could collect or had on hand to the requester, and then follow this up with the computer printout or profile of abstracts of documents available in ERIC files on that subject when it finally arrived.

Thus, in both western States, requests which could be answered with materials available in the information center, or through manual searches done in the State library or elsewhere, or by other personal and local efforts of the retrieval staff were serviced more speedily than those answered through computerized searches. But although these locally handled requests received faster service, they were not, of course, answered on the basis of an extensive survey of the vast national pool of educational research, as was intended to be done through computer searches. It is unrealistic to expect reference center staff members to do manual searches of ERIC indexes once the volume of requests reaches a high level.

These figures for States A and B can be contrasted with an average turn-around time of two and a half weeks for State C in the early stages of the project. (State C's figure came from dates on a log of 43 requests received in December. However, the average turn-around time was figured only on the

basis of the 20 of those 43 requests which had been completed--of the remaining requests, 14 were "in process" and 9 were "pending". Thus, the figure may not be exactly comparable with those for States A and B, where the averages were based on a much higher proportion of the total load of cases, but at least some of the State C requesters were receiving reasonably fast service, including computerized searches.) Coding limitations of the computer program and excessive computer time to run the program made request processing a slow procedure. Most probably, the same problem had developed in the Regional Center. States A and B simply forwarded the written request forms to the Regional Center, and coding for the computer search was done by its staff. Possibly the delays were due to an overloaded staff doing this work, not to an overload or a backlog for the computer itself.

The Regional Center shut down its service completely January 14, 1971 for reprogramming. The retrieval center director in State A recalls that there was approximately a month's advance notice that the service would be inoperative for a while (they were closed about three weeks) so that the field agents - and through them potential users - could be warned ahead of time. State A continued sending requests to the Regional Center during that period, allowing the backlog to accumulate there. Meanwhile, the staff in State A did manual searches when possible to answer requests; but the necessity of a shutdown contributed to even lengthier delays in replying to users. In State B, dissatisfactions with the Regional Center and turn-around time had already prompted the project staff to provide some alternative methods of answering requests, but resources and supplies for these methods had not yet been received. Thus, during the period of the shutdown, for the majority of the cases, requests for information just could not be filled. Thus, only three of the 63 requests for ERIC searches in January were filled that month.

Since that time the Regional Center has modified its method of operation. A great many of the requests for information referred to them now are answered with "packages", that is, packets of research abstracts and other materials on a previously prepared listing of topics. The main reason for the new packaged services was the length of time required for the Search in Depth, or SID, as the separate computer search for an individual request is termed. SID's are still performed to answer a request for information from the project States if the Regional Center decides it is necessary, which is usually based on a decision that none of the packaged services is applicable or adequate. State A retrieval personnel report that the average turn-around is still three weeks if an SID is done on a request. A one-week turn-around was promised by the Regional Center for its new packaged services, and both States A and B reported this summer (1971) that it is meeting that promise. The State A director estimated that the total turn-around to a user for the pre-packaged material in answer to a request would average about nine days, including mailing time for receipt of the request and return of the material by the State information center.

It should be noted, however, that this retrieval center director believed that the concern about lengthy turn-around time may not be matched by irritation from the users. Few clients in State A have complained or said the service was too slow, even when questioned specifically about this.

B. Irrelevancy and inadequacy of materials

There have also been concerns about the quality of the output, a matter which must inevitably be considered with any computerized retrieval system. States A and B could try to assess the output received, but because they were relying on a distant computer staff, they were hampered in efforts to influence the methods used in the process or to improve the product.

The bulk of the returns from the Regional Center has consisted of computer printouts of abstracts (of articles, reports or other documents), supposedly all concerning the subject on which the requester wanted information. These printouts result from a computer search of all the data and research in ERIC. Although theoretically the regional installation could draw on a wider range of resources, any of these - even the CIJE (Current Index to Journals in Education) files - required manual searches, and the Center was not required to supply manual searches to the two pilot States (although it did to its other clients). Output from the wider range of sources is included in one of the packaged services which the Regional Center is now offering. There have been occasional instances when copies of other documents were received but, in general, returns to the Pilot States have been restricted to a profile (or printout of abstracts) of ERIC documents. The relevance and adequacy of the output have both caused concern. State B throughout the first months of the project voiced repeated criticism about the high percentage of the listed articles or documents which seemed obviously irrelevant to the client's interest, while in State A the paucity of research turned up on particular topics was frequently noted.

As yet we have no systematic check of the users' evaluation of the information returned to them. State B recently received a compilation of figures based on the Regional Center's evaluation forms, but the response rate was so poor that these statistics cannot be relied on for definitive conclusions. If one can assume, however, that the forms were more often returned by clients who were satisfied with the service (which is usual in this type of survey), then it is noteworthy that 36 percent of these 109 clients indicated that less than half of the computer searches (abstracts) were pertinent to their

request. Incidentally, one of our observers mentioned at a staff meeting in that State in December that he had watched a field agent glancing over a profile before returning it to a client and immediately marking off at least 75 percent of the items as obviously irrelevant.

The State A retrieval director estimates that there are no relevant abstracts at all included in the listing for only about 10 percent of the cases returned by the Regional Center. "There's almost always something that's useful, at least one article," he said. His impression is that a tabulation of client responses on the form included in the Regional Center packet would show 45 to 50 percent of the users assessing about half of the output as relevant.

In the beginning, this retrieval director was quite concerned about several instances in which it seemed that there was no ~~research available~~ in ERIC on a topic. After a random examination of cases in the "closed" file, our observer in that State cited several specific instances where the ERIC search produced little useful material or very few articles, or where there seemed to be nothing at all in ERIC directly on the subject. A request for reports on ungraded social studies programs for junior high schools, for example, elicited only four articles. Another requester asked for information on two different topics -- computer programs for assisting instruction and performance-contracting as related to intelligence testing; ERIC produced nothing on either topic (although the retrieval center attempted to help the requester through other means). For a request for material on district-wide coordination in rural areas, the return from the Regional Center included nothing on curriculum coordination, which was the main point of the request.

The retrieval director's concern about this problem has been somewhat alleviated because he has not encountered the irritation from users which he

anticipated. "The clients are not as disappointed on that point as we (the retrieval staff) are. They are just as interested sometimes to learn that there is no research on their topic," he reported.

With the topics on which research is actually conducted being determined by such a diverse and haphazard collection of factors, not the least influential being the individual curiosity of investigators, the explanation for the inadequacy of these responses to requests may well be that there are surprising gaps in the educational research literature - that there literally is no research on that topic. Or it may be that pertinent research on topics gets lost or is not found by any specific computer search because of faults in the indexing or categorization of materials put into the data bank, or on the computer tapes. Personnel in a state retrieval office would have little remedial power if the explanation is either of these factors, other than possible long-range effects through spotting examples of such omissions or defects and making Office of Education officials or others aware of them.

But the explanations for disappointing output from computerized retrieval of information may be on a lower level. Some other factors which influence the success or failure of such an operation are:

1) The wording of the topic on which information is requested. The requester may have been rather uncertain about what his question was or he may not have articulated it specifically enough even if he had a very clear idea; and the field agent may not have spotted this inadequacy or made up for it. If the retrieval center in the state is ordering the computer search (i.e., coding the information request for the computer), this problem is more likely to be recognized and to be remedied inasmuch as they can call the field agent and get him to recheck with the user on exactly what he wants. If the retrieval center is simply relaying requests to a far-off service, the wording is probably scrutinized less carefully and deficiencies or ambiguities are less likely to be noted.

2) The instructions or coding of the order for the computer search. The coder may misinterpret the intent or meaning of the request or may not use the most productive terms in ordering the search. For example, one request was for information on the rationale for parent-teacher conferences. The Regional Center used the descriptor "school-community relations" and returned a listing of articles which were mostly irrelevant to the request. The State reference center directory experimenting with their new computerized retrieval capability used the term "parent-teacher conferences" and received in return a listing of twenty articles, all of which looked relevant. A State retrieval office could make similar errors in ordering their own computer searches, but at least they would have some recourse--mistakes might be spotted and a search redone. In an instance like this, if the State staff had not been able to experiment with different descriptors, they might have assumed that the fault was not with the coding of the request but that there was, in fact, no research available on that topic.

In State C where the project uses its own computer, retrieval personnel responsible for ordering computer searches point out that relevancy of the output is almost entirely a result of the coding: relevancy may vary from 2 percent to 100 percent depending on deliberate decisions made by the coder in ordering the search. If the retrieval expert suspects there will be little research on the topic of a particular request, instructions to the computer may be written so as to extract every bit of data that might even conceivably bear on the subject, with full awareness ahead of time that in so doing a good many useless and irrelevant listings will be cited as well. In another case, the staff member might be aware that a great deal of research had been done in the area of the topic and the aim in coding would be to limit the output in advance,

to instruct the computer to exclude much material and list only items fitting much more specific definitions.

(3) Economic factors involved in computerized retrieval, especially a regional center doing big-volume business, and limitations of the program used on the computer. The relevancy of the computer search output especially may be dependent on such factors. For example, it simply may not be economically feasible for a regional center, with big volume business and far-distant clients, to do specifically tailored searches. They may find it frequently necessary to settle for searches on a more generalized level.

Whatever the explanation for the irrelevant and inadequate returns, states depending on a computerized search from a far-distant source are grossly handicapped in tacking these problems because they are unable to monitor the entire retrieval process. To whatever extent any of these three listed factors are involved (and most especially #2 or #3), a state not controlling its own computer searches has little hope of taking remedial action.

C. Pre-packaged information

In the early months of 1971 Regional Center administrators visited the retrieval offices in the two pilot states to explain and "sell" the new packaged services they were to start offering. Given the record to that point, both states might have been disinclined to continue the Regional Center service, but--primarily because of these new packaged services--both decided to continue, on a paying basis. The new services are:

Selected materials on high interest topics, including a combination of ERIC abstracts and xeroxed articles from current journals. These packets provide "survey-type background information" on topics such as accountability, behavioral objectives and individualized instruction, topics which have been the subject of numerous requests for information received in recent years.

A packet of ERIC abstracts in a specific subject or grade level area: art education, early childhood education, elementary school counseling, and so forth.

A quarterly review of the most recent ERIC abstracts in a particular area. There are 30 titles or categories so far defined and listed in the quarterly review. Once an individual is identified as interested in information in one of these areas or categories, he is automatically sent abstracts of the more recent ERIC reports in that area each quarter. Some of the categories are educational facilities, educational finance, language arts, etc. In a way, the service is similar to subscribing to a specialized professional journal.

These services are essentially pre-packaged materials on various topics stacked on the shelf, "waiting for order", in one retrieval director's terminology.* State A attempted to buy only the packaged services--or to get one copy of every package developed which they might then duplicate themselves--but the Regional Center refused. Obviously, the regional service was hoping to subsidize its expensive and time-consuming individual computer searches with the new pre-packaged services. The Regional Center itself finally determines which requests are answered through individual searches

*Information received this summer indicates that as yet the contents of the packages are not definitely set. In August, the Regional Center was rerunning the computer search each time a request for one of the "packaged" services was received, and hard copy of the complete articles to be included in any packet was duplicated after the specific request was on hand.

and which by packages. In State A, approximately half the requests forwarded to the Regional Center are still receiving an SID. But information on the new services--on how to order them and on all the packaged categories--has been widely disseminated, both to field agents and to users in the two states, and many of the requests now received in both states are for specific packages, or on one of the topics in the listings. A client sometimes requests a specific package and also an SID on the topic in which he is interested.

Project personnel in both states consider the packages and the new services to be excellent. In early March, the State A retrieval director reported at a staff meeting that the regional service had a three-week turn-around time even on its packages (as it still has for SID's) and concluded that they may have been "a little premature in their advertisement" of the new services. However, before the summer, both states reported that the Regional Center was meeting its promise of one-week service on the packages--faster service had been the most emphasized selling point of the modified basis of their service.

Still, it should be noted that there are points of concern about packaged information. Even though packages are rated very high on quality of materials and research included about a topic, requests for information answered in this way do not receive quite as much individual service and "tailoring" as those answered by an SID. Another continuing concern will be how frequently the packages are updated. The Regional Center has promised that all the packaged services will be updated every two to three months, but retrieval centers answering requests for information with packaged materials may need to check constantly to insure that its clients are receiving the most current research on these topics. Finally, and most important, clients

given a list of topics on which information is available are being approached in an entirely different way than clients who are urged to define their problems or needs for information, with promises of research information or other assistance which might be useful to them. To a large extent, the problem or need is defined by the range of available packages, rather than by the individual client. To be sure, both in-depth searches and packages can be used at the same time. Also, a retrieval center doing its own searches is likely to attempt to develop its own package to answer an often-repeated request in its locality, or at least to economize and streamline its operations by not duplicating a recently done search. In any event, project staffs in the states are finding that the new packages are being well received by users and are frequently requested.

D. Costs

There is no completely valid basis for arriving at cost-per-request figures for the Regional Center service, since the states did not pay for the service during the initial year and presumably the cost for the across-the-board individual search service would have been higher than that set for the second year with much of the service on a packaged basis.* But, with this disclaimer aforehand, we have attempted some elementary arithmetic to get a better sense of the cost of the computerized retrieval capacity to the two western project states. Using the volume of requests received in the first

* One state reported a $15.00 charge and the other an $8.00 charge by the Regional Center for any clients not legitimately included in the project whose requests were nonetheless relayed by the State retrieval center for servicing by the Regional Center. We consider these figures to represent charges--per-request, rather than accurately assessed costs-per-request and thus have not used them to calculate what the Regional Center service would have cost the state during the initial year if they had paid for it. The cost during this second year, as reported to us, will be $4,200 for State B and $4,500 for State A for each six month period. We have not explanation as yet for the discrepancy in costs for the service reported to us by the two states.

part of 1971 (the projects were not well underway before January, 1971, so including months previous to that would only distort the figure further) and the cost estimated for the Regional Center service in fiscal 1971-72, the cost would have averaged slightly more than $10.50 per request in both states.**

It is possible that there will be no real ground for a comparison between the cost-per-request during the first year of the project and during the second, since the nature of the service is so drastically different. The new packages are being widely publicized, for example, in State B. The Project Director there estimated the cost per search at $8 (on the basis of charges from the Regional Center during the previous year to paying

** This is figured on the following basis: For State A, a total of 422 requests for the six-month period January through June, 1971, divided into the cost of $4,500 set for the next six months, for an average of $10.65 per request. This assumes that all State A requests were referred to the Retrieval Center but a small percentage were not. For State B, the 260 requests received during the first four months of 1971 which were referred to the Regional Center divided into $2,800, which would have been the cost of the service for that length of time on their 1971-72 rate, equals $10.77 per request. (We used only the first four months of the year in figuring the State B average because their rate of requests more than tripled for the month of May, but almost all of these were for packages. Out of 216 requests received during May, only 13 were for SID's and all the rest were for one of the packaged services. The number of requests in State B was lower in June and July). State A showed some increase in the volume of requests received in May, but much less than the State B increase, and it is not clear that their increase was due to a solicitation of orders for the new packages. During June, their requests were back to the former average rate. If the cost-per-request is figured for State A on the basis of the first four months of 1971 only, it equals $12.25 per request--the reason it is higher is almost exclusively due to the higher rate of cost of the Regional service to State A as reported to us. (This figure comes from dividing a total of 245 requests for January through April, 1971, into what would have been the Regional Center cost at the 1971-72 rate for that time period, $3,000).

customers in the state such as universities, not on costs for project requests, for which there was no charge). Thus, he urged his project staff to send in at least 1,050 requests for the coming year in order to justify the decision to spend $8,400 for the regional services, and he added that given the nature of the packages their project staff might well even get 10,000 requests for the year and thereby heavily utilize the regional services. His admonition to the field agents was followed by a tremendous upsurge in the number of requests received by the reference center and relayed to the Regional Center during May--the volume of 216 requests for that month was more than triple the former average for 1971 of 65 requests per month. Almost half of that month's requests were for quarterly review packages. Only 13 were for individual computer searches and the remainder were for the other two packaged services.

We attempted above to figure a cost per computer search for the initial year. If the State B pattern is followed and the number of requests increases so drastically the coming year, then the cost per request will be much lower, but this will in great part be a cost per package rather than per individualized computer search.

State C has not as yet been able to arrive at a figure for the cost-per-search of their computer service. The project director explained that there are so many complexities in assigning total overhead costs to project requests, non-project requests (their information center answers a significant number of requests from school districts in the State other than the two target districts) and the State Department of Education at large (since the computer services the whole department) that it has not been possible to settle on a single cost-per-search figure. Thus, we do not have a comparison of the costs of providing computerized retrieval capacities within a State with the use of a more distant source for computer searches.

In general, to the evaluation team, the experiences of States A and B during the initial year of the project suggests that a State starting an information retrieval operation should not expect that dependence on another State or on a far distant source will provide a satisfactory computerized retrieval capacity; if they opt for such a service, it should probably be viewed as an initial stopgap measure. Realistically, they probably should assume that development of their own computerized capabilities will be necessary. Thus, they can tackle from the outset the issues of obtaining equipment and personnel necessary for that capacity and problems of making it operational, a process that is likely to require some months of effort. Both western States in the project have moved in that direction. If they had envisioned that necessity initially, they might have become independently operational in a shorter time and also been able to arrive at more realistic assessments of the cost of a retrieval operation.

E. Manual search vs computer utilization

The issue of the quality of material returned to users by an information service obviously involves many more factors than just the mechanics of a computer operation. Undoubtedly, as retrieval staffs gain experience and begin to handle larger volumes of requests, they will begin more and more to discriminate among requests and to develop considerable differentiation in procedures for answering different kinds of requests. For the retrieval office the basic question may boil down to a constant balancing of considerations about the quality of output against considerations of cost.

One reference center director recently wrote for a quarterly progress report that "for general topics, manual searches are too costly and time

consuming"; while "for highly restricted or specialized search topics, a manual search is the most efficient method to use." A specific example cited was a recent request for information on auditory programs; the user was concerned not with the teaching of the deaf but of hard-of-hearing pupils. This reference center director knows from past experience that there is not much in ERIC on that specific subject and that the results of a compu search are likely to be disappointing, with much of the output concerning deaf children and little pertaining to the rather different problems of teaching those who have only impaired hearing. For this particular request, he would decide on a manual search, concentrating especially on doctoral dissertations and master's theses. But such a search will require five to seven hours of staff time, so few cases per week can be given such treatment. That reference center had a staff member who enjoyed manual searching, but even so, they had to limit the requests so handled to two or three per week. This director thinks that a retrieval center might well have one person on its staff assigned to do nothing but manual searches, but this is not possible with the size of the staff they now have.

Thus, a retrieval center might anticipate that they will need to make decisions about operational procedures along this line--which requests can be adequately and most economically answered by computer service and which ones should be answered through manual searches, ignoring the computer; and, if they are going to offer the latter service, how it will be provided.

In State C, as mentioned before, this issue is first confronted by discriminating among requests and using considerable variation in coding procedures for the computer search, depending on the type of request. Initially their retrieval staff was doing a hand search of CIJE routinely for each request (only ERIC data was on their computer), but a time study prompted them

to add this resource to the computer data. Now their retrieval staff may check the Education Index if very little is produced by the computer search. Manual searches of other SEA sources are conducted and additional material may be provided through an arrangement with the State library.

Operational decisions on this issue will likely change from time to time. As the volume of requests increases, a retrieval center might become less able to offer the kind of service implied by manual searches because of the necessity of handling all requests faster and more routinely. The solution might lie in the enlargement of its own staff to cope with the bigger volume and the specialization that this might allow for staff members, or in arrangements with other institutions which might provide the service. Also, operational factors may be changed by the addition of new sources of data to the computer, or by making computer searches for specific topics more economical through modifications in the QUERY program or changes in coding techniques ordering the search. And the general situation will change as well. Judgements on the issue of manual versus computerized retrieval of information, while they will vary according to the situation and capacities of each retrieval center, ultimately rely on the technology currently available, and this is in a stage of tremendous development. Given the best programs now available for computerized retrieval of information and the best operation possible of those programs, requests of a highly specific nature may as yet be more economically and efficiently serviced through a manual search than through a computer search. But as soon as new programs are developed or current ones improved, the point at which that line is drawn will have to be reassessed.

F. The QUERY Program

Our earlier conclusion that reliance on distant computerized searcher will prove unsatisfactory does not mean that setting up a local system will be

easy sledding. As mentioned previously, State A decided before their field agents started work that the State should purchase the QUERY program and develop its own computerized retrieval capability. They expected to be operational by December, 1970, although they had several more months after that of "free" service from the Regional Center available. But after the QUERY tapes arrived and were installed, they discovered in January, 1971, that their own cost was $40 per search. At a meeting in March, staff members reported to their project director that they had only nine returns out of their most recent batch of 12 requests, that the turn-around time on their own computer (which is a part of that State's computerized system for school statistics and data) was still one week, and admitted that "we're certainly far from achieving the depth in coverage that's coming out of the Regional Center." One staff member explained her opposition to using their QUERY package "as it exists now" in economic terms: "we've already spent $975 this month. It cost us $600 to run 15 searches ... The current package ties up the entire computer."

The project staff, working with personnel of the State board of education computer center, made continual efforts to solve these problems, and by the end of April the cost had been reduced to $15 per search. They aimed to have it further reduced to $7 per search by the summer, but only a slight reduction--to $14 per search--had been achieved by September. However, their own turn-around time for individualized searches was only one week. State A discovered--as, apparently, do most QUERY users--that a great deal of time and expertise is required to make the program operational and efficient; modifications to fit each individual installation are likely to be necessary.

State B, in the spring of 1971, also purchased QUERY and tapes with the ERIC data for a computer in their State. The program was installed in June,

but is not working as yet. A consultant from the contractor held a two-day training session then, but the retrieval center director indicated that more training, even on coding techniques, will be necessary. With the experiences of the other two pilot States as a warning, the State B staff may have realistic expectations of the initial difficulties likely to be encountered with QUERY. In reporting that the newly installed program was not yet working, the retrieval director said, "But we have a year to do it," referring to their prior purchase of the regional service for the coming year.

State C had obtained the computer search capability for ERIC, or the QUERY program, before their project began. A history of their experiences is probably typical.

First, members of the retrieval staff had to learn how to use QUERY, or how to code requests for the computer. The initial training session by a consultant from the QUERY contractor was judged very good by the two members of the reference center who were attempting to gain this new skill. A few weeks later, at the time of the first site visit of the training team, computer searches were being successfully completed. But searches were taking four to five hours of computer time, according to the new director of that State's computer center. The State department of education had installed a new, faster computer over the summer. The computer center director estimated that on their former, slower machine, searches under QUERY would have taken 10 to 12 hours of computer time and that this would have been impossible. Searches on the new machine were possible only because the capacity of the machine was not being fully used as yet and it was a multi-job machine (handling up to seven different jobs simultaneously).

A member of the training team for the pilot states discussed coding procedures and their specific problems with State C staff members on the first site visit of the training team. This appeared to be an exceddingly helpful session, as reported by a member of the evaluation team. One of the retrieval staff members recently recalled that the discussion may have been somewhat useful but that the main problem facing her and her colleague at that point was lack of experience. They understood theoretically how to do the coding; what they needed was more practice. Experience did increase the coding efficiency fo the operation to some degree; however, they were able to code only a four to six searches in a batch which required a minimum of two and one-half hours of computer time. This still was far from satisfactory. After the communication specialists were named for the Srate's target districts and began their work, the number of requests for information began to increase significantly. With the higher volume, the information center could not keep up with the demand. Also, even though the staff members became more expert, the laboriousness of the coding procedure was a continuing problem and a serious obstacle to the whole operation of their service. QUERY was operational, but it wasn't efficient.

One of the staff members in State C recently observed that the critical fault with QUERY is that the program, as written, was set up so that a request could be very specific about the topic of the search, but that also, unfortunately, the request had to be very specific. Under QUERY, their limitation for an order to the computer is set in terms of the number of lines of instructions: they can send a maximum of 30 lines of instructions (or coding) for each run through the computer (or batch of requests), regardless of how many individual requests (or searches) may be included in that batch. But at that time, each

individual request required eight to fifteen lines of coding, which meant that only a few request could be handled simultaneously within the 30-line limitation. It took a retrieval staff coder about a half hour for each case, in addition to severely curtailing the number of cases which could be included for each computer run. The result was four to six requests included in a batch, at a maximum, and each batch required two and one-half hours of computer time as a minimum. Also, a detailed time and motion study of the operations of their office in January indicated that all the steps in the processing of each single request required approximately three hours of staff time.

The State C staff felt that changes for greater efficiency were necessary. Coincidentally, several members of the staff heard a presentation made by Dave Altus, associated with the ERIC Clearinghouse on Rural Education and Small Schools in New Mexico, while attending an educational conference. He described modifications he had made in QUERY for his own use, and subsequently, State C asked him to come as a consultant to help them with their own QUERY problems. Altus came in January, and as a result of his modifications in the QUERY tape and in coding procedures, State C was suddenly able to process up to 25 requests per batch in 15 minutes compu er time. Coding a single request now takes about five minutes (compared with fifteen minutes previously), and staff members find they can code a batch of 15 requests in an hour and a half. Each request now requires only one or two lines of coded instructions

generally; thus, many more requests can be included in the 30-line limit per batch.*

Could the State C project have been saved months of problems and much cost if they had been steered to Altus before they accidentally heard his speech at an educational conference? Possibly; but also perhaps not, according to a retrieval staff member: "It took us that long to know the changes we wanted to make in the coding." One would hope that not everyone who begins his experience with QUERY in the future must necessarily follow the same circuitous route to making the program serve him efficiently, but that some of the difficulties can be avoided on the basis of the previous experience of other users.

Other changes introduced by State C in its operations included obtaining the computer tapes of CIJE (Current Index to Journals in Education) on which they had been previously doing a manual search for every request. The reference center has now eliminated almost all the manual searching of CIJE done by their staff, cutting out approximately one and a half hours of the staff time formerly required in the processing of a request. (As mentioned

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* In brief, the coding changes introduced by Altus made it possible to code only parts of some words involved in the search topic rather than every letter in the word (e.g., "dary instead of "secondary"), and allowed coding of only non-asterisk ones. (In the coding procedure, asterisk terms are the primary subjects or topics of the request; non-asterisk ones are the subsidiary, less important or more general ones. Previously, the coder frequently had to include the same word preceded by an asterisk and again without an asterisk.) In addition, coding instructions now specify which ERIC clearinghouse data the computer is to search. Data on the ERIC tape is stored according to the clearinghouse from which it originates, and--although there are some ambiguities or overlap--the clearinghouses are distinguished by the subject of the material. Thus, one can specify the single clearinghouse, or possibly the two or three, which would have research on any particular subject. This change accounts for the big decrease in computer time required per batch, since the computer no longer searches the entirety of its data bank for every search.

elsewhere, the state library does manual searching for them.) Also, as the volume of requests increased--to slightly more than 100 in January and again in June, with levels generally near 70-80 per month in the intervening period--the staff of their information center was enlarged.*

Another improvement in their computer performance has been achieved very recently. After installation of CIJE, the computer performance has been achieved very recently. After installation of CIJE, the computer was not printing out the journal volume or page number. Staff members had the time-consuming and irritating task of looking up all those numbers in the CIJE printed index and copying by hand onto the printout intended for the requester the journal citations for each document. They assumed that this deficiency was built into the program, but on a trip to the ERIC information service in another State, one staff member noticed that CIJE titles and authors were supplied by the computer on printouts. Thus, the State C crew realized, as a result of another fortunate coincidental encounter, that the deficiency was either on their own tape or in the way it was operating. State C staff members began making phone calls--to Washington, to the retrieval staff in another pilot project, to the original consultant for the QUERY contractor, and to their onw computer center director. Finally, they were able to determine that an instruction card was missing for the CIJE printout program. Again, because of a relatively accidental observation and considerable initiative in trying to find an answer, several minutes of staff time have been saved on every request. A new time study done in June showed that, as a result of all these changes, the staff time required for servicing a

*State C now has eight members on its retrieval staff: the director of the unit, who is different from the director of the project, who is in the state department of education; four professionals; and two secretaries and clerks.

request had been cut in half since January, or down to 90 minutes per request.

II. Furnishing the Client With Complete Copy

Another issue confronting all three States in the project was how to provide complete copy of reports or articles in which a requester decided he was interested after seeing abstracts of them. The various questions which had to be investigated and answered by each State included the following:

A. Microfiche copy or hard (printed) copy

While there are obvious advantages to providing a requester with a printed copy of an article in which he has indicated interest, technology has yet to make this economically feasible in all cases. In general, the States have decided to return microfiche copy. Articles or references resulting from manual searches, as opposed to the computer search, and various other materials and resources may be supplied by xeroxing or other methods of copying. The PREP packages, for example, are duplicated in bulk by two pilot States and made widely available through the information center and field agents. But complete copy of ERIC items is usually provided in microfiche form because of the high cost of reproducing printed copy, and the field agents have then the additional role of acquainting requesters with new equipment--the microfiche reader--and providing it for their use.

In State A, the initial return package from the computer search includes a cover sheet listing all the various places in the State, such as State colleges, etc., where either microfiche copy or hard copy for the articles cited on the printout may be obtained. The retrieval center does not provide complete copy to clients as a general rule, although field agents in the two

target districts may get microfiche copy for their requesters. Also, the retrieval center director reported, if a client calls and says there is no copying facility available or convenient for him to use, the retrieval center would make arrangements to get microfiche copy for him. The retrieval center does not have the machine for producing microfiche copies, but the State library has the microfiche collection and will send out microfiche copy and portable microfiche readers on loan. The retrieval center does have a machine for making hard copy from microfiche and supplies this service for personnel in the SEA on requests.

Nor does the central office of the State C project have the capacity to duplicate microfiche. They generally order microfiche copy from an adjoining State--in fact, this is the one service for which they still rely on their neighbor State. (In the original proposal, they intended to depend on the other State's information service for all of their computerized retrieval capacity.) However, available resources for copying within their own State are utilized in various ways. The field agent in one target district has the facilities of a microfiche reader-printer and the microfiche collections in his district. A State college for women is in the other target district, and the field agent there can get hard copy through them and utilize their microfiche collection. This field agent scans the complete copy of the microfiche document and makes hard copy of a few pages which she regards as especially useful. She then returns these pages with the whole article in microfiche to the requester and then explains that other pages can also be copied. She feels that this encourages the requester to tackle the microfiche reading: the printed pages may pique his interest and suggest that he will not need to take notes. He can simply check specific pages he wants for future reference, and thereby confront the microfiche reader only once for a given article.

B. Paying for complete copy

The State A staff phrased this issue, on the agenda of one of the initial staff meetings, as "Fee or free to client?" Since the client in non-target districts makes his own arrangements to get complete copy from the institution nearest him with copying facilities, he pays for it himself. In the target districts, the project furnishes microfiche copy to clients through the field agents, one using the facilities of the State library and the other those of the State university.

In State C, complete copy--whether in microfiche form or in hard copy--is provided free to clients in the two target districts. Requesters from other school districts in the State must pay for their copy. In State B, the project might pay for one or two pages of hard copy sent to a requester but not for copies of complete articles. They intend next year to send out microfiche copies on loan. In general, clients will pay for copies of articles that they request, although this cost may be covered by the intermediate agency, or regional office, out of which the field agents operate. Whatever the answer, or variety of answers, to this question by a State information service, the cost is nominal for documents in microfiche form but can mount to several dollars per article for hard copy.

C. Microfiche hardware

In the preceding discussion, there have been repeated references to the basic microfiche data collection, the microfiche reproducer, the microfiche reader-printer (for producing hard copy) and microfiche readers. It is clear that the availability of these resources will be essential to the functioning of a retrieval office. And although "hardware" might seem to be a mundane issue, a cut-and-dried problem with obvious answers, difficulties during the project have caused repeated instances of irritation, frustration or even complete interruption

of the whole process of supplying information to users. One of our observers in the early stages of the project found a retrieval staff director completely disgusted after his first attempt to provide hard copy of an article with the available microfiche reader-printer. Various field agents have voiced dissatisfaction with certain microfiche readers, or reported that since their single microfiche reader was not working and no others were available in the area, none of their clients could read copies of articles. In general, each state has had to devote considerable time and effort during the year to determining the availability of equipment, how much additional equipment would be needed for effective functioning, and whether certain models or brands are preferable.

D. One State's experiences

Documentation of difficulties caused by these issues is more fully available for State B, so experiences of that State might be seen as a kind of case history. This pilot State had not made decisions on these various points until the project was well underway and the field agents had been at work for some weeks. They may have assumed that hard copy of needed articles would be provided by one of the three universities in the State which had the ERIC microfiche collection. In mid-October, they discovered that the cost of this would be prohibitive: the rates charged by the three institutions ranged from 10 to 25 cents per page. Even if there were a slight discount for the project, their budget could not absorb such charges, and few requesters were likely to be willing to pay several dollars for a short article, much less a conceivable $25 for a long government report. State B had on hand at this time a dozen requests for complete copy of articles or reports abstracted in the profiles returned to clients. The retrieval center director determined that one of the requested reports had been published--but the cost was $19. On the other hand, the State department of education did not have the microfiche collection

of ERIC and CIJE or the capacity to copy microfiche, and the schools in general did not have microfiche readers. The three State universities which had this would not circulate their collection, nor could they copy it in microfiche. Hard copy could be ordered from the national supplier, but this would take a great deal of time for each request and the cost was only slightly lower than the in-State reproduction cost. Thus, State B was caught with a backlog of requests for complete copy and a dilemma about how to service them, since these basic questions had not been decided in advance. Although decisions on these issues were finally made, State B field agents had difficulty getting complete copy of an article or report for a requester throughout the year and were able to return complete copy, at least of ERIC or CIJE materials, in relatively few cases, until the summer of 1971--some nine or ten months after the project had begun and six months after operational decisions had been made.

The combination of dissatisfaction with the Regional Center service and problems in delivering copies of complete reports or articles (either in hard copy or microfiche) led State B to consider various alternative plans of operation. At a staff meeting December 2, 1970, these alternatives were discussed. In summary, the deicisions made then were the following:

1) The Field Agents should have copies (in printed form) of various indexes of educational research: specifically the RIE (for ERIC), CIJE and Pacesetter. At present, field agents also have PREP kits and will have NCEC materials as they become available. The plan was that the field agents (or their secretaries) would do a manual search as soon as a request for information was received, and that by xeroxing copies of the abstracts listed in source close at hand would be able to return some pertinent abstracts to their requesters within a very short time.

2) The state department of education, or the state information center of the project, would purchase the complete microfiche collection of ERIC and CIJE. Thus, they would be able to supply complete copy of documents from their own resources.

3) Field agents will have microfiche readers that could be loaned to requesters who wished to read complete copies of those articles in which they were interested.

A fourth decision, finalized later, to purchase the QUERY program and computer tapes of ERIC and CIJE data, has already been mentioned.

But once these decisions were made, the State P team faced what they felt to be endless frustrations in putting them into effect. Long negotiations were necessary to work out arrangements for the assignment of a computer suitable for QUERY to the state department of education. Although resources and equipment needed for the new plan of operation were ordered, there were delays in receiving almost every part of it. Even obtaining the printed indexes for the field agents took some months. The purchase of the whole microfiche collection for the state department of education, by state law, had to be let out for bids, even though it was available only from one source in the nation. Since the national contractor was changed at about this time, the original purchase order was returned, and the whole bid-letting procedure had to be gone through a second time before a new order could be sent in.

Although most of these problems had been cleared up by the summer, 1971, there may be further complications in the manner in which the new plans for operation actually work during the coming year. Even though the field agents have their basic resources and may look up descriptors, they have not actually done real searches. Thorough individual searches on a topic are still supplied only by the Regional Center with its lengthy turn-around time. Hopefully,

this will be remedied when QUERY is made operational in that State. In practice, the field agents have been relying more and more on packaged services, looking up what appear to be relevant categories in the listings of these services supplied by the Regional Center. Insofar as supplying complete copy is concerned, the retrieval office plans to loan the microfiche copy of any requested document from its newly acquired collection. But they do not have the capacity to reproduce microfiche, nor does their SEA, so they are constrained to send out their only copy. If they get numerous requests for the same article, they will make arrangements with a local commercial establishment to make extra copies of that document, but they do not plan to duplicate the requested microfiche copy routinely. Finally, field agents have only one microfiche reader apiece, which can be a major problem in States with target districts which encompass a large geographical area. If the reader is not working or is out on loan to another user, then a requester may have to wait a considerable time after his microfiche article has been returned before reading it. The field agents might take the machine with them or keep it in their office, rather than loaning it, but it is not feasible for a client to read a long report or document while the field agent is waiting around. On the other hand, if he leaves the machine with the requester, some days or even weeks may pass before he can pick it up. The distances traveled by field agents servicing multiple school districts spread over a large area create problems which would not be as serious for an agent servicing a single school district or town, or even a county.

III. Record Keeping and Filing

A third major area to which retrieval staffs have had to devote considerable attention has been that of filing and record keeping. For the most part they felt it was necessary to determine through their own experiences what systems best serve the needs of the project in their state. At various times during the year, each state has made some modifications in their filing and record-keeping systems. Again, this may seem a mundane issue worthy of little mental energy, but experiences of the pilot states seem to indicate that it is worth considerable effort--and even more usefully, considerable forethought and analysis--because of the effects that the systems being used have on efficiency of operation. In several instances retrieval personnel in the pilot states have reported how worthwhile it was to add new files or change the way of keeping a former set of files because of the surprising amount of time they could save.

One member of the training team for the pilot states, who has concentrated on these problems, has been praised by retrieval personnel. The sessions that he conducted at the first training workshop, his consultations with individuals and suggestions about problems that arose, as well as examples of systems used by a retrieval center that he directs--all have been cited as most useful.

Although each state devised its own systems and procedures initially, we have noted that the different state retrieval offices have opted frequently for the same or a very similar solution to a particular problem. This may result from the training team's influence, or from communication among the pilot states--or it may be, as we suspect, that there is one answer which has definite advantages over others.

The basic element that a retrieval office deals with is an individual request for information. Thus, the primary record-keeping system should be in terms of a specific request for information, and not in terms of the requester. (The obverse would be true of a doctor's office, where the basic unit to be serviced is patients, or the whole person and his history, not the current complaint). Record-keeping difficulties seems to result if a particular request is primarily classified according to the person making the request, or the subject on which information may be available or requested, or the nature of the service requested--since persons may make multiple requests, a request may pertain to multiple subjects, and a single case may be serviced in multiple ways. Thus, the best system seems to be the assignment of an identification number to each request, numbering the requests chronologically as they are received by the reference center. (The training team has suggested preceding these numbers with the last two digits of the year--e.g., 70--0001, 70--0002, etc., then 71--0182, 71-0183, etc.). Other matters, such as keeping track of the topics of requests or of the requests from each field agent, can be handled by simply cross-referencing in subject and person files.

In State A when a new request is received, it is placed in a manila folder -- these have all been pre-numbered chronologically -- and a complete case record is started. Every record pertaining to the case and the servicing of it, including a list of all bibliographies and materials returned, goes into the folder. When the request has been answered and work on it is finished, the folder is moved from the "Open" file drawer to the "Closed" file drawer. In addition, the office keeps a rotary subject file: all the informational resources

and materials in the office have been numbered; entries under any particular subject in the rotary file include this number which, in essence, tells exactly where in the office the material may be located. The office also has a box of index cards, filed by subject, of all the searches they have done previously.

State B initially decided to use the request form issued by the Regional Center. Some difficulties resulted when these were all prenumbered and different batches given to different field agents. The field agents did not necessarily use their forms in the numbered order and forms were being returned simultaneously by all agents, each of whom had numbers in a different range. Thus, there was no numerical order of the identification numbers received by the reference center. In addition, no number at all was assigned to a request that was not to be forwarded to the Regional Center for a computerized search. They have now devised their own information request form and these will be chronologically numbered.

State C gave considerable thought before their project began to the forms they would use for their records and the different files they would keep. They also kept a case record file (chronologically numbered) that detailed the processing and servicing of each request. But there was one page, the bibliography sheet listing all sources cited to the client and materials returned, that was put into a subject file together with a copy of the computer print-out. In the spring, 1971, they began to recognize that some requests were almost exactly the same as previous ones. At one time the newsletter of the school district served by one field agent listed all topics on which she had provided information to date. The state office was thereupon flooded with 60 requests for duplicates of one or more of the previous searches. Pulling

out the materials from the various parts of the subject file -- putting the cases back together, so to speak -- was enormously time consuming, and the staff decided there would be greater benefits from keeping a file of each complete case. They instituted this new procedure for requests and, gradually, as staff members found time, they re-assembled the files for cases handled earlier during the year. Staff members cited the change with great enthusiasm, and long before the change-over job was completed, were already finding "a tremendous time saving" under the new method.

State C also keeps a copy of the actual coding instructions for the computer search in its case record. The old subject file will be maintained but will house resources other than case records that is, all the materials on various subjects that come into the office and may be useful on a request. They also recently developed another file in which a card is made for every descriptor in the ERIC Thesaurus implied by a request. These cards, with the exact wording of the request and its case number, will be filed according to descriptors.

These observations should suffice to indicate the direct consequences of office systems on the efficiency of an information and retrieval service. An additional reward of effective and serviceable record-keeping systems may come in demonstrating its worth to local and national supporters. Most such centers, if set up as a new service of the state department of education or on an experimental basis, will at some point or another have to justify their existence or, if supported by federal funds, to persuade the state to foot the bill when that source of support is discontinued. Numbers alone may be insignificant, but an effective record-keeping system should provide materials that will greatly facilitate the job of summing up results claimed by the service.

As the history of the pilot states implies, those in future projects who are attempting to establish a new information retrieval system would do well to visit an existing office and analyze in great detail their systems of record keeping and filing. In this area, there is now a supply of expertise and experience which should be drawn upon in advance. There can be little advantage in developing one's own systems through trial and error. Indeed, harsher terms might rightly be used: for future states there should be no excuse for the time and effort wasted by necessary redoing and remaking of systems once a project is underway. Modifications to meet idiosyncratic needs of a particular state can be added without upsetting basically satisfactory systems. Primary requirements are sufficiently generalizable so that the systems can be organized in advance. And they should be established from the outset, even though they might seem overly elaborate to the neophyte.

IV. Staffing

Summarizing the ideal background and qualifications to be sought in a retrieval staff member is impossible for reasons which should by now be obvious: the diverse tasks that confront a retrieval system and reference center imply requirements of an equally diverse range of background skills and experience. A partial list of the capabilities that a retrieval staff should have at the outset or attain in short order includes the following:

1) computer skills;

2) library and research skills, or experience as a research librarian, most usefully in an education library;

3) familiarity with educational hardware and technology, and preferably experience in judging and procuring such equipment;

4) expertise in office systems and management, record keeping and filing.

This excludes a matter not dealt with in this paper but which some would consider the prime characteristic needed for retrieval staff members: considerable knowledge of educational research (knowledge of its substance, not just how to obtain it); familiarity with the current status and directions of research and with the institutions where the most innovative new practices are emerging; and finally, and most important, the perspectives, standards and experience for evaluating the worth of research data, new proposals and experiments. An acquaintance with the state's schools, their characteristics and personnel, might well prove an asset which would be invaluable.

Rarely are these qualifications found in one person. Future states might wish to anticipate that they will start with a small retrieval office and staff, as did one of the pilot states. But they should realize that as the volume of requests increases and as the scope of the office enlarges to take on all these diverse functions of an information service, a multi-person and multi-skilled staff will almost certainly be a necessity.

A couple of other points might be made. Although computerized retrieval of information and research was a basic part of the project, the directors in the three pilot states apparently did not make computer experience or expertise a requirement for retrieval staffs. In all three states, only one person employed for the retrieval operations had any prior experience with computers. There may well be valid reasons for the Director's decisions not to look for such competence, but it should be emphasized that even though the retrieval staff may look elsewhere for actual computer expertise, they will surely need some knowledge, at least on the theoretic level, of the possibilities and limita-

tions of computerized retrieval of information. Even though it may not be necessary for the center to have a computer programmer, some staff members will have to learn at least the coding techniques for the specific program used for the computer searches.

Another point is that some of these skills and experiences may be found more readily in fields other than education. Even though the retrieval-information office is set up in the state department of education, future state directors might look for some staff members outside of educational circles. Such diversity is more feasible, of course, if the staff of the retrieval center is larger. Indeed, the information center with the largest staff among the pilot states does have some members whose degrees were not in education.

The benefits from the division of labor according to the talents and propensities of individual staff members have been cited by two states. (The other pilot state has only one person with part-time secretarial help on its retrieval staff). In State A, one staff member, who majored in English education enjoys doing research and individualized manual searches, while another, whose background was as a school administrator, concentrates more on other aspects of the service. State C, which has four subordinate professionals under the center director on its staff, reports a fortuitous meshing of talents. One English major especially likes writing jobs, while another staff member prefers doing only the research, gathering all the relevant data on a subject. As a writer-researcher team, these two have already prepared one long report, the first time that state has attempted one of its special aims: not only gathering all available information on urrently important educational topic in the state but also correlating it,

synthesizing it, writing it up in a single paper. A third member of the office, with a social science major in college, has taken special responsibilities in overseeing and maintaining the office's record-keeping systems. The fourth, formerly a teacher who specialized in reading, is the only one of the staff who has been with the project since its inception and who helped write the original proposal. She was also one of the original pair who learned QUERY, and knows more about the field of education and educational developments than others on the retrieval staff. In short, diversification of background and interests seems highly beneficial.

V. Recommendations for Future Projects

A summary statement of some of the recommendations suggested by the experiences of the first three pilot states might be useful for future states attempting to establish information dissemination projects.

1) A state should plan initially to provide its own computerized search capacity. Reliance on a regional installation means that the information service will have little chance of influencing such matters as turnaround time, relevance or adequacy of the computerized search. Thus, resorting to a distant computer service should be viewed at best as a stopgap measure, one that will ultimately prove unsatisfactory.

2) A state should anticipate difficulty, frustration and delay, probably more than the contractors would predict, in making the QUERY program for computerized searches operational and efficient in their own installations. This has happened so generally that an information service making the decision to install QUERY might well plan to send their computer and retrieval personnel to an installation with a similar computer capacity and set-up which has already been through the process, to study in detail the pitfalls and obstacles which prior projects have already experienced and found ways of overcoming.

3) The Office of Education or the QUERY contractor should aim at nursemaiding new installations attempting to achieve computerized search capabilities through the first few months. Their responsibility should extend to the point where the program is operational -- and, to some extent, efficiently and economically operational -- not just to the point of purchase and installation. Perhaps detailed, step-by-step case studies of the experiences of those who have installed QUERY could be compiled and furnished to newcomers to the process. Or perhaps the Office of Education or the QUERY contractor should provide task force teams, or more consultants, or more extensive and specific guidelines or analysis of the individual problems facing a new installation. Whatever the method, our impression is that the pilot states have not had enough expert assistance on this score. New state projects should be able to purchase that expertise and service when they purchase the program.

4) The rationale behind packaged information services should be well understood. To the extent that they are used, it should be with full awareness of possible differences -- in approach to users and in their likelihood of effecting change -- between information supplied on this basis and the aim of individualized service. One must not simply assume that the appeal of packaged information to clients lies in its content. For packages relieve school personnel from the difficult task of defining exactly what their <u>own</u> need or problem is, and thus, eventually from the burden of evaluating the applicability of specific information to their own situation. This is especially true of the packages that are intended simply to raise awareness of certain educational developments. These packages require <u>probing follow-ups</u> to see if more detailed information or consultation is desired. However, if packages are disseminated broadside, individual follow-up will become virtually impossible.

5) Retrieval services from the outset should adopt a stance of continual reassessment of their modus operandi. A constant balancing of cost factors versus the quality of the output and service, of what is feasible with available staff and what is the potential of available technology -- these are the basic issues behind policies about whether requests will be answered by manual searches or by computerized searches; and which should be serviced by packages and which by individual searches.

6) The computerized search for abstracts or existing educational research is only the first step toward the real aim of the information service, which is to provide complete copy of research documents, articles or reports (or sections thereof) which would be useful to a client. Procedures for completing the process should be determined in advance: In what form should complete copy be provided -- microfiche or hard copy? How and where can either microfiche or hard copy be obtained? If microfiche is the only feasible format, what techniques can be adopted to overcome the obstacle this presents for users? How much will complete copy cost and who will pay for it? What hardware is available and what will be necessary for making the whole process function? How can the necessary resources and hardware be obtained?

7) Personnel establishing an information service would do well to visit an existing retrieval service and analyze in detail their record-keeping and filing systems. Basic systems should be outlined in advance and maintained from the outset. Considerable expertise and guidelines on this score have evolved through the trial-and-error experiences of existing retrieval services.

8) The entire range of qualifications and capabilities required by an information service staff should be envisioned in advance, and the staff should consist of more than one or two individuals. Thus, a project director might consider which characteristics are most essential at the outset, how certain necessary capabilities (perhaps, for example, computer expertise or familiarity with the potentials and problems of computerized retrieval) can be provided for the service by outsiders if not by the initial staff, and the advantages that will result from a diversification of backgrounds and qualifications of staff members, not only in the initial staff but through additions in the future.